WHAT IS CLAIM IS:

1. An aortic catheter for segmenting and selectively perfusing a patient's aorta comprising:

(a) an elongated shaft having a proximal end, a distal end and a length sufficient to be inserted into an ascending aorta and guided transluminally in an antegrade direction such that said distal end is positioned in a descending aorta when in the operative position and said proximal end resides external to the patient when in an operative position;

(b) a proximal portion of said elongated shaft having an inner coil reinforced shaft whose internal diameter defines a corporeal perfusion lumen and an outer coil reinforced shaft, said inner coil reinforced shaft and said outer coil reinforced shaft configured in a coaxial relationship such that an annular space is created therebetween;

(c) an arch perfusion lumen defined by said annular space terminating as at least one arch perfusion port positioned along the length of said elongated shaft proximal to said flow control valve regulator;

(d) a distal portion of said elongated shaft defined by said inner coil reinforced shaft and terminating as at least one or more corporeal perfusion ports;

(e) a flow control regulator positioned proximal to said distal end and distal to said at least one arch perfusion ports, said flow control regulator sized and configured to at least partially occlude the aorta; and

(f) a distal tip configured for insertion into the ascending aorta.

2. The aortic catheter of claim 1, wherein said elongated shaft is from 4 and 30 cm in length.

3. The aortic catheter of claim 1, wherein said corporeal perfusion lumen is connected to a _ inch to ¼ inch barb reducer for connection to a perfusion pump.

4. The aortic catheter of claim 1, wherein said arch perfusion lumen is connected to a 1/4 inch barb connector for connection to a perfusion pump.

5. The aortic catheter of claim 4, wherein said barb connector is coupled to a luer fitting for monitoring perfusion pressure.

6. The aortic catheter of claim 3, wherein said barb connector is coupled to a luer fitting for withdrawing fluid samples and injecting medications.

7. The aortic catheter of claim 1, wherein said inner coil reinforced shaft has an internal diameter of approximately 0.025" to 0.3".

8. The aortic catheter of claim 1, wherein said outer coil reinforced shaft has an internal diameter of approximately 0.15" to 0.35".

9. The aortic catheter of claim 1, wherein said corporeal perfusion lumen is sized and configured to communicate blood flow at a flow rate of approximately 0.5 L/min to 8 L/min with a pressure drop of approximately 0 mm Hg to 300 mm Hg.

10. The aortic catheter of claim 1, wherein said arch perfusion lumen is sized and configured to communicate blood flow at a flow rate of approximately 0.1 L/min to 3 L/min with a pressure drop of approximately 0 mm Hg to 300 mm Hg.

11. The aortic catheter of claim 1, wherein the combined flow rate of the arch perfusion lumen and the corporeal perfusion lumen is of approximately 0.6 L/min to 10 L/min with a pressure drop approximately of 0 mm Hg to 300 mm Hg.

12. The aortic catheter of claim 1, further comprising an actuation lumen, said actuation lumen having a proximal end coupled to an actuation source and a distal port in fluid communication with said flow control regulator such that communication from said actuation source actuates said flow control regulator.

13. The aortic catheter of claim 12, wherein said flow control regulator is a balloon.

14. The aortic catheter of claim 13, wherein said balloon is made of a material selected from the group consisting of polymers and elastomers.

15. The aortic catheter of claim 13, wherein said balloon has an inflated outer diameter of approximately .5 to 4.0 cm.

16. The aortic catheter of claim 13, wherein said balloon has a radiopaque marker positioned within said balloon.

17. The aortic catheter of claim 1, wherein said flow control regulator is in the form of an actively deployed peripheral flow control valve regulator.

18. The aortic catheter of claim 1, wherein said flow control regulator is in the form of an actively deployed central flow control valve regulator.

19. The aortic catheter of claim 1, wherein said flow control regulator is in the form of an actively deployed peripheral flow control valve regulator with at least one actuating balloon.

20. The aortic catheter of claim 1, wherein said flow control regulator is a passively deployed peripheral flow control valve regulator.

21. The aortic catheter of claim 20; wherein said passively deployed peripheral flow control valve regulator has at least one leaflet.

22. The aortic catheter of claim 1, wherein said flow control regulator is a passively deployed central flow control valve regulator.

23. The aortic catheter of claim 1, wherein said distal tip is formed of a temperature sensitive material.

24. The aortic catheter of claim 1, wherein said elongated shaft has a curvature configured to conform to a patient's aortic arch anatomy.

25. The aortic catheter of claim 1, wherein said at least one arch perfusion port comprises from 1 to 16 external holes.

26. The aortic catheter of claim 1, wherein said at least one corporeal perfusion port comprises from 1-8 external holes.

27. An aortic catheter for segmenting and selectively perfusing an aorta comprising:

(a) an elongated shaft having a proximal end and a distal end, said elongated shaft of sufficient length to be inserted into an ascending aorta and guided transluminally such that the distal end is positioned in a descending aorta when in an operative position;

(b) a flow control regulator positioned on said elongated shaft such that when said distal end is in the operative position said flow control regulator is capable of at least partially occluding the descending aorta;

(c) a proximal portion of said elongated shaft having a corporeal perfusion lumen and an arch perfusion lumen, said arch perfusion lumen terminating as at least one or more arch perfusion port proximate to a patient's arch vessels; and

(d) a distal portion of said elongated shaft extending beyond said proximal portion, terminating as at least one or more corporeal perfusion port distal to said flow control regulator.

28. The aortic catheter of claim 27, wherein said catheter shaft is from 4 and 30 cm in length.

29. The aortic catheter of claim 27, wherein said corporeal perfusion lumen is connected to a 3/8 inch to 1/4 inch barb reducer for connection to a perfusion pump.

30. The aortic catheter of claim 27, wherein said arch perfusion lumen is connected to a 1/4 inch barb connector for connection to a perfusion pump.

31. The aortic catheter of claim 30, wherein said barb connector is coupled to a luer fitting for monitoring perfusion pressure.

32. The aortic catheter of claim 29, wherein said barb reducer is coupled to a luer fitting for withdrawing fluid samples and injecting medications.

33. The aortic catheter of claim 27, further comprising an actuation lumen, said actuation lumen having a proximal end coupled to an actuation source and a distal port in communication with said flow control regulator such that communication from said actuation source actuates said flow control regulator.

34. The aortic catheter of claim 27, wherein said flow control regulator is a balloon.

35. The aortic catheter of claim 34, wherein said balloon is made of a material selected from the group consisting of polymers and elastomers.

36. The aortic catheter of claim 34, wherein said balloon has an inflated outer diameter of approximately 1.5 to 4.0 cm.

37. The aortic catheter of claim 34, wherein said balloon has a radiopaque marker positioned within said balloon.

38. The aortic catheter of claim 27, wherein said flow control regulator is in the form of an actively deployed peripheral flow control valve regulator.

39. The aortic catheter of claim 27, wherein said flow control regulator is in the form of an actively deployed central flow control valve regulator.

40. The aortic catheter of claim 27, wherein said flow control regulator is in the form of an actively deployed peripheral flow control valve regulator with an at least one actuating balloon.

41. The aortic catheter of claim 27, wherein said flow control regulator is a passively deployed peripheral flow control valve regulator.

42. The aortic catheter of claim 41; wherein said passively deployed peripheral flow control valve regulator has at least one leaflet.

43. The aortic catheter of claim 27, wherein said flow control regulator is a passively deployed central flow control valve regulator.

44. The aortic catheter of claim 27, wherein said distal tip is configured to be temperature sensitive.

45. The aortic catheter of claim 27, wherein said elongated shaft has a curvature configured to conform to a patient's aortic arch anatomy.

46. The aortic catheter of claim 27, wherein said at least one arch perfusion port comprises approximately 1 to 16 external holes.

47. The aortic catheter of claim 1, wherein said at least one corporeal perfusion port comprises approximately 1 to 8 external holes.

48. A method for segmenting and selectively perfusing an aorta of a patient comprising the steps of:

(a) providing an aortic catheter having a corporeal perfusion lumen in fluid communication with a corporeal perfusion port, an arch perfusion lumen in fluid communication with an arch perfusion port, and a flow control regulator positioned between said corporeal perfusion port and said arch perfusion port;

(b) extending an elongated shaft of said aortic catheter transluminally to the descending aorta downstream of the left subclavian artery;

(c) occluding the ascending aorta to prohibit substantial blood flow in the patient's ascending aorta;

(d) actuating said flow control regulator to prohibit substantial blood flow in the patient's descending aorta; and

(e) coupling said arch perfusion lumen and said corporeal perfusion lumen to an oxygenation pump to provide differential perfusion to a patient through said arch perfusion port and said corporeal perfusion port.

49. The method of segmenting and selectively perfusing the aorta of a patient of claim 48, wherein:

the step of extending an elongated shaft transluminally to the descending aorta is carried out by inserting said elongated shaft through a patient's ascending aorta.

50. The method of segmenting and selectively perfusing the aorta of a patient of claim 48, wherein:

the step of actuating said flow control regulator is carried out by inflating an occlusion balloon.

51. The method of segmenting and selectively perfusing the aorta of a patient of claim 48, wherein:

the step of actuating said flow control regulator is carried out by passively actuating a peripheral flow control valve regulator.

52. The method of segmenting and selectively perfusing the aorta of a patient of claim 48, wherein:

the step of actuating said flow control regulator is carried out by actively actuating a peripheral flow control valve regulator.

53. The method of segmenting and selectively perfusing the aorta of a patient of claim 48, wherein:

the step of actuating said flow control regulator is carried out by actively actuating a central flow control valve regulator.

54. The method of segmenting and selectively perfusing the aorta of a patient of claim 48, further comprising:

perfusing the aortic arch with a predetermined flow and chemical composition and perfusing the corporeal circulation with a second predetermined flow and chemical composition that is different from the first.

55. The method of segmenting and selectively perfusing the aorta of a patient of claim 48, further comprising:

perfusing the aortic arch with a predetermined flow and chemical composition and perfusing the corporeal circulation with a second predetermined flow and chemical composition that is the same as the first.

56. The method of segmenting and selectively perfusing the aorta of a patient of claim 48, further comprising:

withdrawing fluid from the patient through a venous cannula;

oxygenating the withdrawn fluid; and

perfusing the aortic arch with cold oxygenated fluid through an arch perfusion port; and perfusing the corporeal body with normothermic oxygenated fluid through a corporeal perfusion port.

57. The method of segmenting and selectively perfusing the aorta of a patient of claim 48, further comprising:

inducing cardiac arrest.

58. The method of segmenting and selectively perfusing the aorta of a patient of claim 48, further comprising:

applying an external cross clamp to the ascending aorta and delivering crystalloid cardioplegia to the coronary arteries.

59. The method of segmenting and selectively perfusing the aorta of a patient of claim 48, further comprising:

applying an external side biting clamp to the ascending aorta and delivering retrograde blood cardioplegia to the coronary arteries.

60. The method of segmenting and selectively perfusing the aorta of a patient of claim 48, further comprising:

inducing cardiac arrest in a patient by supplying cold oxygenated blood to the heart and arch vessels.

61. The method of segmenting and selectively perfusing the aorta of a patient of claim 48, further comprising:

perfusing the patient with differential pressure, flow and chemical composition.

62. A method for segmenting and selectively perfusing an aorta comprising the steps of:

(a) inserting a distal end of an aortic catheter into the ascending aorta;

(b) extending an elongated shaft of the aortic catheter transluminally past the aortic arch such that a flow control regulator mounted on said elongated shaft proximal to said distal end is positioned in the descending aorta downstream of the left subclavian artery;

(c) occluding the ascending aorta prohibiting substantial blood flow;

(d) arresting the heart;

(e) actuating the flow control regulator prohibiting substantial blood flow in the descending aorta; thereby segmenting the aorta into an aortic arch perfusion site upstream of the flow control regulator and a downstream corporeal perfusion site downstream to said flow control regulator;

(f) withdrawing blood from the patient through a venous cannula;
oxygenating the withdrawn blood; and

(g) perfusing the aortic arch with cold oxygenated blood through an arch perfusion port and perfusing the corporeal body with normothermic oxygenated blood through a corporeal perfusion port.

63. The method of segmenting and selectively perfusing the aorta of a patient of claim 62, wherein:

the step of actuating said flow control regulator is carried out by inflating an occlusion balloon.

64. The method of segmenting and selectively perfusing the aorta of a patient of claim 62, wherein:

the step of actuating said flow control regulator is carried out by passively actuating a peripheral flow control valve regulator.

65. The method of segmenting and selectively perfusing the aorta of a patient of claim 62, wherein:

the step of actuating said flow control regulator is carried out by actively actuating a peripheral flow control valve regulator.

66. The method of segmenting and selectively perfusing the aorta of a patient of claim 62, wherein:

the step of actuating said flow control regulator is carried out by actively actuating a central flow control valve regulator.

67. The method of segmenting and selectively perfusing the aorta of a patient of claim 62, further comprising:

perfusing the aortic arch with a predetermined flow and chemical composition and perfusing the corporeal circulation with a second predetermined flow and chemical composition that is different from the first.

68. The method of segmenting and selectively perfusing the aorta of a patient of claim 62, further comprising:

perfusing the aortic arch with a predetermined flow, temperature and chemical composition and perfusing the corporeal circulation with a second predetermined flow temperature and chemical composition that is the same as the first.

69. The method of segmenting and selectively perfusing the aorta of a patient of claim 62, further comprising:

inducing cardiac arrest in the patient.

70. The method of segmenting and selectively perfusing the aorta of a patient of claim 62, further comprising:

infusing a cardioneuroplegic agent into the patient's aorta.

71. The method of segmenting and selectively perfusing the aorta of a patient of claim 62, further comprising:

inducing cardiac arrest in a patient by supplying cold oxygenated blood to the heart.

72. A method for selectively perfusing a patient's aorta comprising the steps of:

(a) providing an aortic catheter having a corporeal perfusion lumen and an arch perfusion lumen, said corporeal perfusion lumen terminating as at least one corporeal perfusion port and said arch perfusion lumen terminating as at least one corporeal perfusion port;

(b) introducing said aortic catheter into the ascending aorta of a patient;

(c) navigating said aortic catheter through the aortic lumen of a patient until said at least one arch perfusion port is positioned proximate to the arch vessels and said at least one corporeal perfusion port is positioned in the descending aorta;

(d) occluding the ascending aorta substantially impairing at least some blood flow;

(e) arresting the heart;

(f) withdrawing blood from the patient through a venous cannula;

(g) oxygenating the withdrawn blood; and

(h) perfusing the aortic arch vessels with cold oxygenated blood through said at least one arch perfusion port and perfusing the corporeal circulation with normothermic oxygenated fluid through said at least one corporeal perfusion port.

73. An aortic catheter system for segmenting and selectively perfusing a patient's aorta comprising:

an elongated shaft, said elongated shaft having an arch perfusion lumen in fluid communication with an arch perfusion port a corporeal perfusion lumen in fluid communication with a corporeal perfusion port and a flow control regulator positioned between said arch perfusion port and said corporeal perfusion port, said elongated shaft is introduced through the ascending aorta and is configured to be advanced transluminally such that when in the operative position said flow control regulator resides in the descending aorta and is configured to prohibit substantial blood flow through the aorta; and

a cardiopulmonary bypass machine coupled to said arch perfusion lumen and said corporeal perfusion lumen and capable of providing cold and warm oxygenated blood to the patient.

74. An aortic catheter system for segmenting and selectively perfusing a patient's aorta comprising:

an elongated shaft having a blood flow lumen in fluid communication with an arch perfusion port and a corporeal perfusion port, a flow control regulator positioned between said arch perfusion port and said corporeal perfusion port, said elongated shaft configured to be

advanced transluminally such that when in the operative position said flow control regulator resides in the descending aorta and is configured to prohibit substantial blood flow in the aorta;

means for providing oxygenated blood to the patient; and

means for at least partially occluding the ascending aorta.

75. The aortic catheter system for segmenting and selectively perfusing a patient's aorta of claim 74, further comprising:

a venous cannula having a drainage lumen connected to a cardiopulmonary bypass system.

76. The aortic catheter system for segmenting and selectively perfusing a patient's aorta of claim 74, wherein the arch perfusion lumen and the corporeal perfusion lumen are in a coaxial relationship.

77. The aortic catheter system for segmenting and selectively perfusing a patient's aorta of claim 74, wherein means for at least partially occluding the ascending aorta is a cross-clamp.

78. A method for segmenting, selectively perfusing and arresting a patient's heart comprising the steps of:

(a) inserting a distal end of an aortic catheter into the ascending aorta;

(b) extending an elongated shaft of the aortic catheter transluminally past the aortic arch such that a flow control regulator mounted on said elongated shaft proximal to said distal end is positioned in the descending aorta downstream of the left subclavian artery;

(c) actuating the flow control regulator prohibiting substantial blood flow in the descending aorta; thereby segmenting the aorta into an aortic arch perfusion site upstream of the flow control regulator and a downstream corporeal perfusion site downstream to said flow control regulator;

(d) perfusing the aortic arch with cold oxygenated blood through an arch perfusion port and perfusing the corporeal body with normothermic oxygenated blood through a corporeal perfusion port; and

(e) arresting a patient's heart.

79. The method of segmenting, selectively perfusing and arresting a patient's heart of claim 78, wherein:

the step of arresting a patient's heart is carried out by perfusing the heart with cold oxygenated fluid.

80. The method of segmenting, selectively perfusing and arresting a patient's heart of claim 79, further comprising:

injecting a small bolus of cardioplegia.